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→ examine procurement procedures and to FMSO (Fleet Materials Support Office) to determine the functions of CHIL (Consolidated Hazardous Items List) and how it can be used in the hazardous material program. A current list of documents relating to hazardous materials was prepared, a definition of hazardous materials was written and a proposed NAVAIRSYSCOM (Naval Air Systems Command) hazardous materials safety instruction was drafted. →

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## I N T R O D U C T I O N

By reference (a) NAVAIRDEVCCEN (Naval Air Development Center) was requested to draft a hazardous material safety instruction and prepare revisions to major specifications for the purpose of identifying hazardous materials in weapon systems or ground support equipment. In a meeting at NAVAIRSYSCOM (Naval Air Systems Command), reference (b), it was agreed that the NAVAIRSYSCOM instruction should include a precise definition of hazardous materials. It should identify sources of information on hazardous materials and provide guidelines for acquiring the information. At a second meeting, reference (c), a draft of the proposed "NAVAIRSYSCOM Hazardous Material Safety Program Instruction" was presented for review. On the basis of the discussion at this meeting a revised draft (Appendix A) has been prepared. At this meeting it was recommended that procurement procedures for acquiring new materials be studied to find a key to assuring that hazardous materials will be identified and coded.

## I N V E S T I G A T I V E    A P P R O A C H

The work undertaken and discussed herein represents only the introductory effort to an overall hazardous material program which requires follow-on phases. The complete program has been outlined in reference (d). The overall program proposed has been designed to interface with the NAVAIRSYSCOM System Safety Program as well as with other DoD programs. Information and documents on hazardous materials are to be compiled to form a data source which will be readily available to fleet users. An essential requirement will be the establishment of a standard guide that will assure effective warning or caution notices in NAVAIRSYSCOM manuals for hazardous materials.

## DEFINITION OF A HAZARDOUS MATERIAL

Numerous documents were reviewed in order to find an adequate definition for hazardous materials. The definitions were summarized into a composite form (Appendix B) from which a NAVAIRDEVCCEN revised definition was written and included in the first draft of the NAVAIRSYSCOM hazardous material instruction. It has been determined that a short but technically concise definition of a hazardous material is not possible because the issues are complex. For example, when defining toxicity the dosage level for different materials varies from negligible amounts to perhaps many kilograms. It was determined that a modest expansion of the definition, reference (e), would be the most suitable for the instruction (Appendix A).

## ACQUISITION OF DOCUMENTS

Documents applicable to the hazardous material safety program were acquired including selections from OSHA (Occupational Safety and Health Administration) standards, documents referenced by reference (e), and CFR (Code of Federal Regulations) covering safety under the Departments of

Transportation and Labor. Documents such as BuMed Instructions and related hazardous materials information were also reviewed. As the documents were accumulated and reviewed, additional reference materials were found. An effort was made to catalog all of these documents, but the file is incomplete because certain documents are still on order. The current list is attached as Appendix C.

Initially, the work was scheduled to identify and revise NAVAIRSYSCOM major specifications to assure that hazardous materials are coded and properly addressed. Documents such as SD-24, MIL-D-8706, MIL-F-7179, and MIL-R-61294 are examples of such major procurement documents that were reviewed for this purpose. While no reference to hazardous materials was found in these documents, requirements to control such materials can be inserted in these as well as in a number of additional NAVAIRSYSCOM procurement documents yet to be identified and reviewed. Present thinking favors the development of a separate hazardous materials document which could cover all situations and could by itself be kept current with the changing OSHA and related regulations. Such a document could be referenced for definition of requirements in the NAVAIRSYSCOM procurement documents without continuing modification of those procurement documents. It would encompass the entire scope of materials safety standards as required by OSHA, BuMed, etc. To avoid duplication of effort this document might best have DoD level authority.

#### HAZARDOUS MATERIAL INSTRUCTION

Using the acquired documents as background references as well as the NAVAIRDEVGEN System Safety Instruction as a format, a draft of the NAVAIRSYSCOM Hazardous Material Safety Instruction was written. The instruction format contains a purpose, scope, background, definition, specific actions to be performed by the activities under NAVAIRSYSCOM and support that NAVAIRDEVGEN will provide to the Hazardous Material Safety Program.

#### PROCUREMENT POLICIES AND CODING

It is felt that the key to any effective hazardous material safety program is the identification and control of materials procurement to isolate those materials that are hazardous. An effort was made to explore possibilities for developing such a control key within the present procurement system. It was hoped that hazardous materials could be controlled within NAVAIRSYSCOM, but no satisfactory method was found. Personnel in the Procurement and Analyses Branch (AIR-2012) and the Procurement Procedures Branch (AIR-2011) expressed their function as that of dealing with contractors to assure specification compliance as dictated by the technical operations of NAVAIRSYSCOM. As such, they impose no unexpressed technical requirements in the procurement order and would not be in a position to inject hazardous material requirements into a contract. Personnel in the Supply Policy and Procedures Branch (AIR-4121) felt that the control could be achieved during the provisioning process of weapons systems at the parts breakdown phase. The key point in this method is to assign a hazardous material marker at the time that application is made for a FSN (Federal Stock Number). Contacts were made at NAVSUP (Naval Supply Systems Command) and at ASO (Aviation Supply Office) to develop a hazardous material coding point in the application for FSN. There are presently two coding points that are of interest, the DEMIL

code (a DoD required code assigned to material to define disposal procedures) and the D015 code (an ASO code for special handling). Although the DEMIL information is a required input for obtaining a FSN as part of DoD policy, it was not recommended as a hazardous material control point because all materials may not be DEMILed. For example, explosives, solvents, acids, etc., may be consumed or disposed of at sea; thus a DEMIL procedure may not be assigned and this code would not function as a hazardous material key. Similarly, the ASO D015 code presented difficulties in that it is not mandatory information for obtaining a FSN, and no strict technical check is made to validate the supplied information. Even if a check for hazardous materials is made, unless the checker has a strong hazardous material background, hazardous items could enter the system. Thus, as a non-mandatory entry, a FSN could be supplied to a hazardous material with D015 left blank. At first glance it appears that the deficiencies of the D015 system are correctable. D015 can be made mandatory or a separate modification can be instituted, such as D015A, which would be specific for hazardous materials. The technical staff at ASO could be augmented with highly trained material specialists to review all materials and isolate those that are hazardous. However, ASO does not procure the bulk of the hazardous material. These hazardous materials are procured through other activities and a control program based on utilizing any ASO code system would be ineffective unless it could be coordinated with all supply activities and those activities be prepared to handle hazardous material requirements.

A visit was made to FMSO (Fleet Material Support Office) Mechanicsburg, Pennsylvania, to learn the particulars and procedure for the CHIL (Consolidated Hazardous Item List). The CHIL was initiated in 1964 for the purpose of controlling hazardous materials in the Navy. It is updated semiannually and interim bulletins are issued as required. FMSO does not solicit materials for inclusion in the list, thus all listings are voluntary inputs. The CHIL covers transportation and storage of hazardous materials only. It does not list materials that pose operational or use hazard. Labeling and packaging in the CHIL is covered by MIL-STD-313. FMSO has no technical personnel on board to check the validity of the information submitted for inclusion in the list. The major requirement for listing in the CHIL is the material must have a FSN. FMSO is reluctant to change the present system and also reluctant to answer queries on material listed in the CHIL because they presently do not have the specialized staff to fulfill these requirements.

Preparation of a separate hazardous material identification instruction was initiated by NAVAIRDEVCON for fleet activities. It was to contain procedures and guidelines for identifying and reporting hazardous material onboard and sources of hazardous material information; however, the additional work assigned during reference (c) prevented the completion of this and the desired review of specifications, Navy procurement documents and other applicable program documents.

## R E S U L T S

The program to date has brought into focus several pertinent facts:

1. The OSHA basically addresses itself to the industrial environment which includes the use aspects of hazardous materials. The DOT (Department



of Transportation) approach to hazardous materials deals only with shipment, storage, packaging and labeling.

2. The impetus behind the NAVMATINST is to assure that the Navy work environment is compatible with the OSHA standards. For example, specific reference is made to materials ordinarily thought to be safe, but which may become hazardous during use by untrained personnel.

3. The CHIL, which is the functional hazardous material listing document of the NAVMATINST is a DOT oriented document and does not address itself to the OSHA environment.

### C O N C L U S I O N S

1. Work on the hazardous material program, to date, leads to the conclusion that the work unit plan, reference (d), previously recommended is valid and should be undertaken. This effort serves to affirm that the implementation of a hazardous material safety program is a major technical undertaking, and to implement an effective program within reasonable financial limits will require utilization of all data available from other agencies. The sources of hazardous material data are yet to be fully identified, and it must be determined how this data can be best used in the NAVAIRSYSCOM program. The game plan step of reference (d) (milestone chart) is considered vital if an effective NAVAIRSYSCOM Hazardous Material Program is to be achieved. This step includes the identification and a thorough review of the available hazardous material information sources, how they may best be utilized in the NAVAIRSYSCOM program, and a comprehensive objective plan for the NAVAIRSYSCOM Hazardous Material Program.

2. It is concluded that NAVAIRSYSCOM cannot control all hazardous materials being used via the FSN. The bulk of hazardous materials used by NAVAIRSYSCOM is supplied by activities other than ASO, with approximately 90% being supplied by DSA (Defense Supply Agency). The foregoing is an informal estimate provided by FMSO. Thus, if NAVAIRSYSCOM initiated a coding system to identify hazardous materials, it should be compatible with the requirements of DSA to avoid conflict in coding systems; or in the absence of any DSA action, a Navy proposal should be developed on a DSA adaptable system.

3. It is noted that CHIL, which is referred to in reference (e), is not applicable to the total concept of the hazardous material safety program. Reference (e) deals first with materials ordinarily thought to be safe but which may be rendered hazardous under certain use conditions by the uninformed user. It then states that all aspects of accident prevention including transportation and storage must be implemented to protect the user. The CHIL addresses itself to transportation and storage only and not operational conditions.

4. The continual updating of OSHA standards will keep the NAVAIRSYSCOM hazardous material safety program in a state of flux in trying to keep abreast of the everchanging OSHA standards.

NADC-75169-30

A P P E N D I X    A

DRAFT OF NAVAL AIR SYSTEMS COMMAND  
HAZARDOUS MATERIAL SAFETY INSTRUCTION

5. Policy: The hazardous material safety program shall adopt OSHA standards, except in those cases where naval experience indicates that more stringent standards are required.

6. Action:

a. Each NAVAIRSYSCOM activity shall prepare and implement a hazardous material safety program encompassing all hazardous materials under its cognizance, establish a roster identifying hazardous materials, provide handling storage precautions and instructions, specify protective equipment and out-line procedures for safe disposal of hazardous material. A screening program for newly introduced material shall be established to identify any material entering the system that may be hazardous. Information of these hazardous materials can be obtained from CHIL (Consolidated Hazardous Items List), BUMED, NAVAIRSYSCOM documents or NAVAIRDEVCON. Normally, information on hazardous proprietary material must be obtained from the manufacturer. Countermeasures shall be established for each material appearing on the hazardous material roster, which will include specific medical treatment for injured personnel and decontamination in the event of a hazardous material incident. Hazardous material areas shall be identified and properly marked, and a current record shall be maintained on all personnel working in the areas, the hazardous material to which they are being exposed, and the nature of the exposure. The countermeasures shall be in compliance with the current NAVAIRSYSCOM hazardous material safety instructions. A hazardous material training program shall be established to appropriately acquaint personnel with the hazards to which they will be potentially exposed. These personnel shall be indoctrinated yearly in the hazards of the material; trained in the use of protective equipment and devices; indoctrinated in exposure symptoms; receive training in evacuation procedures; informed periodically of the location, purpose, and contents of first-aid equipment, as well as the names and duty stations of persons trained to administer first-aid; receive appropriate indoctrination in personal hygiene; and be provided with training guides.

b. NAVAIRDEVCON will provide technical assistance to each NAVAIRSYSCOM activity in preparing a hazardous material safety program required by this instruction. NAVAIRDEVCON will provide clarification of both this instruction and applicable documents, and will maintain a current list of hazardous material, precautions and disposal procedures required by NAVAIRSYSCOM activities. NAVAIRDEVCON will recommend revisions to NAVAIRSYSCOM hazardous material safety instructions, manuals and other applicable documents and hazardous material lists as needed to maintain conformance with OSHA, BUMED and other applicable safety standards.

c. Development programs shall include a hazardous material review step to identify all hazardous material proposed for use. A concerted effort shall be made to eliminate hazardous material, except where the elimination of such material will impair the required performance. Where hazardous materials are used, appropriate precautions for use, handling, shipping and safe disposal shall be a part of the development program.

d. Material and system procurement contracts shall include a hazardous material clause which shall identify any hazardous material used, precautions

for handling, storage, shipment and disposal. The manufacturer shall be required to supply the hazardous material in containers which will insure safe shipping, storage and handling including operational usage. The container shall be labeled as specified in references (e) and (f) and as per any special safety requirement.

# DEFINITION OF TERMS

For ready reference the following generally used definitions are listed:

Flash Point of the liquid shall mean the temperature at which it gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid within the vessel used as determined by appropriate test procedure and apparatus as specified by OSHA 1910.106(a) (14).

Vapor Pressure shall mean the pressure, measured in pounds per square inch (absolute) exerted by volatile liquid as determined by appropriate test as specified by OSHA 1910.106(a) (30).

Flammable Liquids shall mean any liquid having a flash point below 140°F and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100°F as specified by OSHA 1910.106(a) (19).

Combustible Liquids shall mean any liquid having a flash point at or above 140°F (60°C) and shall be known as C III liquids, as specified by OSHA 1910.106(a) (18).

Toxic Substance is a substance which has the inherent capacity to produce personal injury or illness to a person through ingestion, inhalation or absorption through any body surface. (Manufacturing Chemists' Association, Inc.)

Radioactive Material means any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations, as specified by OSHA 1910.96(a) (2).

Hazardous Substance is any substance or mixture of substances which is (1) toxic; (2) corrosive; (3) an irritant; (4) a strong sensitizer, (5) flammable, or which (6) generates pressure through decomposition, heat or other means, if such substance or mixture of substances may cause substantial personal injury or substantial illness during or as a direct result of any customary or reasonable anticipated handling or use. (Manufacturing Chemists' Association, Inc.)

Compressed Gas is any gas, not elsewhere classified, which when mixed with air in any proportion will burn, and which has one or more of the following criteria:

1. An absolute pressure in the container either exceeding 40 PSI at 70 degrees or exceeding 104 PSI at 130 degrees F or both.
2. A Reid vapor pressure exceeding 40 PSI at 100 degrees F.  
(46 CFR 146.24-1)

Enclosure (1)

**WADC-75189-30**

**A P P E N D I X   B**

**COMPREHENSIVE DEFINITION OF HAZARDOUS MATERIALS**

## APPENDIX B

COMPREHENSIVE DEFINITION OF HAZARDOUS MATERIALS

Hazardous material - any material having one or more of the following properties: (1) flammable; (2) corrosive; (3) an oxidizing agent; (4) explosive; (5) toxic; (6) emits radiation; (7) unduly magnetic; (8) water sensitive fire and explosive hazards; (9) fire and explosive hazards of acid and acid fume-sensitive material; (10) is in a compressed gas state.

Each of the above properties is considered as a separate hazardous category and the following terms and definitions apply to the particular category:

(1) Flammable Materials

(a) Flammable liquid is any liquid that gives off flammable vapor at or below 80°F.

(b) Flammable solid is a solid substance that is likely to cause fires through friction, absorption of moisture, spontaneous chemical changes or which can be readily ignited and burns so vigorously and persistently as to create a hazard.

(c) Flammable compressed gas is any compressed gas, as defined later in para. (10) that will form a flammable mixture of 13% or less (by volume) with air or the flammable range with air is wider than 12%. These limits shall be determined at atmospheric temperature and pressure.

(d) Hypergolic fuel is a fuel that ignites spontaneously with an oxidizer (e.g. aniline with fuming nitric acid).

(e) Pyrophoric fuel is a liquid chemical that ignites spontaneously on exposure to air and burns vigorously (e.g. aluminum trimethyl).

(f) Polymerizable material is any liquid, solid or gaseous material that may combine or react with itself or decomposes so as to cause dangerous evolution of heat.

(g) Flash point of a liquid is the temperature at which it gives off vapors sufficient to form an ignitable mixture with the air.

(h) Ignitable mixture is a mixture within the explosive range that is capable of the propagation of flame away from the source of ignition when ignited.

(i) Ignition temperature of a substance (whether solid, liquid or gaseous) is the minimum temperature required to initiate or cause self-sustained combustion independently of the heating or heated element.

(2) Corrosive Materials are those acids, acid anhydrides, alkalis and other corrosive liquids that when in contact with living tissue will cause severe damage to such tissue by chemical action; or, in case of leakage will cause material damage; or, are likely to cause fire when in contact with

certain chemicals. Some corrosive liquids have very dangerous additional hazards such as toxicity, flammability and explosiveness, e.g.,

(a) Acid fumes react to evolve toxic fumes with sulfides, sulfites, cyanides, arsenides, tellurides, phosphides, borides, silicides, carbides, fluorides, selenides; they liberate hydrogen when in contact with metals and hydrides. Acid mists or fumes corrode structural materials and equipment and are toxic to personnel.

(b) Alkalies may liberate hydrogen upon contact with aluminum and other metals.

(3) An oxidizing agent is a substance such as chlorate, permanganate, peroxide, nitrocarbonitrate or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter.

(4) Explosive is defined as any chemical or mixture which under certain conditions of temperature, shock or chemical action can decompose rapidly to evolve either large volumes of gas or so much heat that the surrounding air is forced to expand very rapidly; in either case an explosion results.

(5) Toxicity is the ability of a chemical molecule or compound to produce injury once it reaches a susceptible site in or on the body. Toxic gases, liquid or solid substances are of such a nature that a very small amount of gas or vapor of the liquid mixed with air is dangerous to life; or that are dangerous by external or internal contact with the body, or that upon contact with fire or when exposed to air gives off dangerous or intensely irritating fumes.

Toxic substances can be encountered in any one of the following ways:

(a) Dust - solid particles generated by handling, crushing, grinding, rapid impact, detonation and decrepitation of organic or inorganic materials. Dusts do not tend to flocculate except under electrostatic forces; they do not diffuse in air, but settle under influence of gravity.

(b) Fumes - solid particles generated by condensation from the gaseous state generally after volatilization of a material and often accompanied by a chemical reaction. Fumes flocculate and sometimes coalesce.

(c) Mists - suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state such as by foaming and atomizing.

(d) Vapors - the gaseous form of substances which are normally in the solid or liquid state and which can be changed to these states either by increasing the pressure or decreasing the temperature alone. Vapors diffuse.

(e) Gases - normally formless fluids which occupy the space of enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Gases diffuse.



(8) Water sensitive fire and explosive hazards - these are materials which react with water, steam or water solutions to evolve heat, flammable gases or explosive gases.

(9) Fire and explosive hazards of acid and acid-fume sensitive material - these are materials which react with acid and acid fumes to evolve heat, hydrogen and flammable and/or explosive gases.

(10) Compressed gas - any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70°F (or an absolute pressure exceeding 104 pounds psi at 130°F) or any flammable liquid material having a Reid vapor pressure exceeding 40 pounds psi absolute at 100°F.

Note: Any compressed gas, as defined above, shall be classified as a flammable compressed gas, if either 13 percent or less (by volume) when mixed with air will form a flammable mixture, or the flammability range with air is greater than 12 percent regardless of the lower limit.

A P P E N D I X   C  
C U R R E N T   D O C U M E N T   L I S T

A P P E N D I X C

CURRENT DOCUMENT LIST

Military Specifications

MIL-M-81260A(AS)	Manuals, Technical, Aircraft/Systems, Equipment Maintenance
MIL-M-81927(AS)	Manuals, Technical; General Preparation of (Microform Compatibility)
MIL-M-38797 (U. S. Air Force)	Manuals Technical; Operation Instructions and Maintenance Instructions
MIL-D-8706B(AS)	Data and Tests, Engineering: Contract Requirements for Aircraft Weapons Systems
MIL-F-7179E	Finishes and Coatings; Protection of Aerospace Weapons Systems, Structures and Parts; General Specification for
MIL-R-81294A	Remover, Paint, Epoxy System

Federal Standards

Federal Standard 5E	Standard Guides for Preparation of Proposed Item Logistics Data Records
Federal Standard 313	Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials

Military Standards

MIL-STD-882	System Safety Program for Systems and Associated Subsystems and Equipment: Requirements for
MIL-STD-755A	Labels Containers for Hazardous Industrial Chemicals and Materials
MIL-STD-1341A	Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials

Other Publications

Code of Federal Regulations, Title 49, Parts 170-180 (Transportation)

Code of Federal Regulations, Title 29, Chapter 17, Part 1910 (Labor)

Occupation Safety and Health Reporter

Toxic Substances List, NIOSH (National Institute for Occupational Safety and Health)

Other Publications (Continued)

NAVSUPPUB 4105, LIRSH (List of Items Requiring Special Handling)

NAVSUPPUB 4500, CHIL (Consolidated Hazardous Item List)

NAVSUPPUB 284, Storage and Handling of Materials

NAVSUPPUB 505, Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft

NAVMATINST P-10470, Safety Equipment Manual

NAVWEPS 15-03-500, Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft

NAVAIR 07-1-505, Technical Manual; Toxicity, Flashpoint, Flammability of Chemicals Used by the Naval Air Systems Command

NAVORD OP 3347 (U.S. Navy), Ordnance Safety Precautions

MIL-HDBK-236D (Navy), Military Standardization Handbook, Index to Standards for Palletizing Truck Loading, Railroad Car Loading and Container Loading of Hazardous Materials

NAVMAT P-5100, Safety Precautions for Shore Activities

NAVSUPINST 5100 - SUP 056B, Hazardous Material Marking and Identification for Receipt, Storage and Handling

NAVMATINST 5100.2 - Reporting of Safety Hazards to Foreign Governments

NAVMATINST 5100.3A - Hazardous Material Safety Program

OPNAVINST 5100.6 - Index of Department Documents Containing Safety Precautions Applicable to the Operating Forces

OPNAVINST 5100.8B - The Department of the Navy Safety Program; Implementation of

NAVMATINST 5100.9 - Review of the Occupational Safety and Health Administration Standards

OPNAVINST 5100.13 - Accident Damage Reporting Procedure for Naval Property Ashore

OPNAVINST 5100.14 - Department of the Navy Shore Safety Program; Promulgation of

NAVAIRDEVCEININST 5100.25A - Hazardous Material Safety Program

NAVSHIPINST 5100.29 - Hazardous Materials Safety Program; NAVSHIPS Implementation and Responsibility for

Other Publications (Continued)

NAVAIRINST 6260.1 - Chlorinated Solvents Instructions; for use of

BUMEDINST 6260.12/12A - Halogenated Hydrocarbons; Health Hazards of

BUMEDINST 6270.2A - Benzene; Health and Safety Hazard of

BUMEDINST 6270.3F - Personnel Exposure Limit Values for Health Hazardous Air Contaminants

BUMEDINST 6270.6 - Potentially Toxic Materials; Precautions Against

BUMEDINST 6270.7 - Otto Fuel II, Health Precautions

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